Mercury Variance Evaluation: Rock Creek Advanced Wastewater Treatment Facility

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State of Oregon
Department of Environmental Quality

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1. Introduction and Background

Clean Water Services (CWS) of Washington County operates four municipal wastewater treatment plants that discharge to the Tualatin River in the Willamette Basin, Oregon. In July 2017, CWS applied for variances from Oregon's methylmercury water quality standard for each of their four wastewater treatment facilities. The four CWS variance applications are the first to be received and evaluated in Oregon. This document describes the Oregon Department of Environmental Quality's (DEQ's) review of the variance application for the Rock Creek Advanced Wastewater Treatment Facility (AWWTF) and provides documentation supporting DEQ's granting of that variance.

1.1 Mercury in the Environment

The following information is excerpted from DEQ's 2006 Mercury Total Maximum Daily Load (TMDL) for the Willamette Basin (pp. 3-7), which may be found at http://www.oregon.gov/deq/FilterDocs/chpt3mercury.pdf. Additional information on mercury and the methylation process may be found in DEQ's TMDL document as well as EPA's 2001 mercury criteria documents, which are available at https://www.epa.gov/wqc/human-health-criteria-methylmercury.

Mercury is a naturally occurring element found in cinnabar deposits and areas of geothermal activity. In Oregon, mercury was mined commercially and used extensively in gold and silver amalgamation (Brooks, 1971; Park and Curtis, 1997). Mercury has been used historically in fungicide formulations and can still be found in many commercial products including fluorescent lights, thermometers, thermostats, automobile switches and dental amalgam. Mercury is also naturally present in vegetation and fossil fuels such as coal, natural gas, diesel fuel and heating oil. The mercury present in these fuel sources is released into the atmosphere upon combustion. This atmospheric mercury can be transported great distances and is known to be deposited on the landscape via wet and dry deposition (Sweet *et al*., 1999, 2003).

Mercury can be present in various physical and chemical forms in the environment (Ullrich *et al.,* 2001; USEPA, 2001b). The majority of the mercury found in the environment is in an inorganic form, but it can be converted to methylmercury by certain anaerobic bacteria. Methylmercury production is affected by a host of physical and chemical factors including temperature, redox potential, dissolved oxygen levels, organic carbon, sulfate concentration and pH. Methylmercury represents the most bioaccumulative form of mercury in fish tissue and the most toxic form of mercury for human consumers (USEPA, 2001a).

1.2 Oregon's Mercury Water Quality Standard and its Application in the Willamette Basin

In 2011, Oregon adopted a fish tissue criterion for methylmercury based on a fish consumption rate of 175 grams/day to protect the health of high consumers of marine and freshwater fish and other seafood. The current human health criterion is 0.04 mg/kg methylmercury in the fish tissue. DEQ revised all the state's human health criteria based on the new fish consumption rate at that time. The Environmental Quality Commission and interested stakeholders understood that some of the toxics criteria based on this consumption rate might not be attainable in some waters. Therefore, at the same time, Oregon reviewed and updated its rules for granting variances to water quality criteria, a tool allowed by federal Clean Water Act regulations (see below for more background information on variances).

DEQ listed the Willamette River as impaired in 1998, before the state had a fish tissue criterion. The listing was based on a fish consumption advisory for mercury issued by the state's Department of Health and Human Services (now the Oregon Health Authority), which indicated that the beneficial use of fish consumption (fishing) was not being protected. In 2003, Oregon adopted a fish tissue criterion for methylmercury based on a fish consumption rate of 17.5 g/day and DEQ used this criterion as the target for the TMDL completed in 2006. EPA did not act on the 2003 criterion until 2010, when it disapproved the criterion. By this time, DEQ was conducting a rulemaking to update all the human health criteria based on an increased fish consumption rate of ~~rate~~175 grams/day. The revised methylmercury fish tissue criterion was adopted in 2011 and was approved by EPA.

The 2006 TMDL development included modeling that generated a bio-accumulation factor (BAF) for the Willamette River for several species of fish. In addition, the TMDL developed a translator to convert the dissolved methylmercury water concentration to a water concentration for total mercury in nanograms/liter (ng/L), which is the mercury parameter typically monitored and used in permit analyses. Through these procedures, the TMDL derived water column targets for total mercury in ng/L based on the BAF for the most sensitive species modelled, the Northern pikeminnow (*Ptychocheilus oregonensis*), at the 50th percentile of the fish tissue data distribution. The resultant fish tissue and water column concentration values from the 2006 TMDL analysis are shown in Table 1.1 below.

Table 1.1 Total Mercury Water Concentration Target

	Fish Tissue Criterion (methylmercury)	Water Column Concentration (total mercury)
2006 TMDL	0.3 mg/kg	0.92 ng/L
Updated TMDL model	0.04 mg/kg	0.14 ng/L

Commented [A1]: Just a note that this value is 0.12 ng/L in the last version of the draft variance. Assume this is the correct value?

In 2018, an EPA contractor conducted the modelling needed to update the water concentration value based on the new methylmercury criterion of 0.04 mg/kg. The revised water column concentration of 0.14 ng/l total mercury will be used to update the TMDL and to evaluate whether a discharge has reasonable potential to cause or contribute to an exceedance of the criterion. In cases where a discharge does have reasonable potential to cause an exceedance of the criterion, a numerically-based effluent limit, expressed as total mercury (THg), must be included in the permit, absent an applicable water quality variance. As described in Chapter 2 below, effluent limits calculated using this water concentration value are not currently achievable by many dischargers, including the Clean Water Services facilities.

1.3 Variances

A variance is a regulatory tool provided under EPA's regulations at 40 CFR 131.14 to address circumstances where a designated use and associated criterion is not currently attainable, but it is possible to make progress toward meeting the criterion and protecting the underlying designated use in the receiving water body. The need for a variance must be justified based upon one of seven factors provided in state and federal regulations.

The Oregon regulations regarding variances are located at OAR 340-041-0059, and are available at this link/URL: https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=1458.
In addition, DEQ developed implementation procedures, which can be found at:
http://www.oregon.gov/deq/Filtered%20Library/IMDVariance.pdf. DEQ plans to update the state's rules in 2019 to ensure they are consistent with federal regulations that were adopted in 2015.

The federal regulations regarding variances are found at 40 CFR 131.14. For more information on variances, see EPA's website at www.epa.gov/wqs-tech/water-quality-standards-variances.

1.4 Facility Description: Rock Creek Advanced Wastewater Treatment Facility

DEQ Permit No: 101144
DEQ File No: 90770
EPA Reference No: OR-0029777

Facility Location: 3235 SW River Road, Hillsboro, Oregon 97123

The Rock Creek AWWTF is a modern treatment facility with a service population of approximately 221,504. The facility is capable of receiving flows from the Hillsboro and Forest Creek wastewater treatment plants, also owned and operated by CWS. The Rock Creek AWWTF provides preliminary screening, primary, secondary and tertiary treatment along with biosolids processing for beneficial land application. This facility has an average dry weather design flow ADWDF of 46.4 million gallons per day (projected for 2025 conditions, see Table 1.2 below), and a daily maximum wet weather flow of 126 MGD. Influent flow is comprised of 83.3 percent domestic and 16.7 percent industrial. The Rock Creek AWWTF has a septage receiving station that discharges directly into the raw sewage pump station. The septage consists primarily of pumping from septic tanks and holding tanks, with a minor amount of chemical toilet waste. Annual septage receiving represents less than 0.005% of the plant flow.

Table 1.2 Annual Average Flow (MGD)

Facility	Average Dry Weather Flow	Average Wet Weather Design Flow	Annual Average Flow
Rock Creek AWWTF	46.4	68.4	57.4

Raw sewage enters the facility through an influent pumping station. Influent quality monitoring at the Rock Creek AWWTF is conducted at the headworks and includes flows from the influent pump station, remote pump stations, and transfer flows from the Hillsboro and Forest Grove WWTF. After the influent pump station, raw sewage flow is directed to three mechanical fine screens for preliminary screening. The screened flow is then directed to one or more of five primary sedimentation tanks. From this point, the primary effluent flow can be sent to either of two secondary treatment systems designed to perform biological nitrogen reduction (referred to as the west-side or east-side systems). The west-side system consists of two diffused air aeration basins followed by six secondary clarifiers while the east-side system consists of three diffused air aeration basins followed by three secondary clarifiers. The east-side secondary effluent flows through ten mono-media gravity filters and the west-side secondary effluent is directed through an Actiflo™ system. Actiflo™ is a high rate clarification process operated to reduce total suspended solids.

During the phosphorus removal season (generally May 1 through September 30), the Actiflo™ system is used to reduce total phosphorus and total suspended solids in the west-side secondary effluent. When excess Actiflo™ capacity is available, secondary effluent from the east-side secondary process can be treated in the Actiflo™ system. The effluent from the Actiflo™ system can be pumped to four mixed-media gravity filters, flow by gravity to two chlorine contact basins, or a combination of both. During the phosphorus removal season, the east-side secondary effluent can be directed to four Claricone upflow solids contact chemical clarifiers with a combined flow capacity of 20 MGD.

Commented [A2]: Observations should be made to determine if there are lower Hg effluent concentrations when the Actiflo system is on. Other state's experience has been that their low Hg facilities tend to be the ones with the highest levels of solids control. If they're experiencing seasonal fluctuations in their Hg concentrations, running the Actiflo system year-round must be explored or discussed why it's not feasible.

Filtered effluent flows into three chlorine contact basins; one east basin and two west basins. Filtered effluent is de-chlorinated and discharged to the Tualatin River year-round at River Mile 37.7 though one 60-inch diameter pipe identified as Outfall R001 in the permit. This outfall includes a multiport diffuser that is approximately 28 feet long and has 12 15-inch ports spread evenly along the diffuser. In addition, the Rock Creek facility has a submerged 8-foot diameter wet weather outfall pipe (Outfall R003) located approximately 50 feet downstream from Outfall R001. This outfall is designed to handle peak wet weather flows when the hydraulic capacity of the diffuser on Outfall R001 is exceeded.

The Rock Creek AWWTF is capable of producing Class A recycled water that is used for on-site irrigation. CWS has used this recycled water to maintain vegetation and water levels at the Natural Treatment System at the Forest Grover WWTF during the summer months. The facility also produces Class B biosolids from primary and secondary wastewater treatment for beneficial land application and/or disposal in accordance with a DEQ-approved biosolids management and land application plan. The AWWTF has two storage silos where digested and dried biosolids cake can be temporarily stored before loading upon trucks for land application. Biosolids are applied to both approved local farm application sites and to arid land sites in eastern Oregon.

2. Treatment Technology Review

In this chapter, DEQ provides information on treatment technologies available to remove mercury from municipal wastewater. This information is used in two parts of the evaluation of the Rock Creek AWWTF variance. First, this information supports DEQ's findings about the need for the variance in Chapter 3 and will be referred to in that discussion. Second, this information supports DEQ's findings about the highest attainable effluent condition in Chapter 4 and will be referred to in that discussion.

2.1 Mercury Removal Achieved by Municipal Treatment Technologies

This section presents data on mercury levels achieved by municipal treatment systems in California and Oregon. California performed a study looking at methyl mercury removal from NPDES permitted dischargers in the Sacramento River Delta[1]. California required dischargers to collect and report on methyl mercury influent and effluent data over twelve months in 2004 and 2005. A subset of these facilities also reported total mercury effluent data. A summary of annual average total mercury effluent concentrations is shown in Figure 2.1. The facilities were categorized as either secondary or tertiary treatment plants. The median of the average annual total mercury effluent concentrations was 8.4 ng/l in secondary treatment plants (n=27) and ranged from 3.1-21.5 ng/l. In tertiary treatment plants (n=22), the median average annual concentration was 4.2 ng/l and ranged from 0.8 – 11.6 ng/l.

DEQ also compiled and analyzed mercury levels from 2016 data provided by municipal dischargers in Oregon (Figure 2.2). In this case, DEQ categorized each system as secondary or advanced. Advanced systems included any in which additional filtration or treatment was installed after secondary treatment. The median average annual total mercury effluent concentration was 2.8 ng/l in secondary treatment plants (n=11) and ranged from 1.2-8.3 ng/l. In advanced treatment plants (i.e., those employing nutrient removal, tertiary or other post-secondary treatment filtration, or both) (n=8), the median annual average concentration was 1.7 ng/l and ranged from 1.1 – 3.0 ng/l. The annual average total mercury concentration at the Rock Creek plant was 1.2 ng/l in 2016. The Oregon data comes from larger facilities that have a pre-treatment program and have implemented source control programs for several to many years. The California data comes from both large and small systems and is 12 years older. These facts may explain why Oregon effluent data has considerably lower concentrations than that from California.

[1] California EPA, Regional Water Quality Control Board, Central Valley Region. 2010. Staff Report: A Review of Methylmercury and Inorganic Mercury Discharges from NPDES Facilities in California's Central Valley.

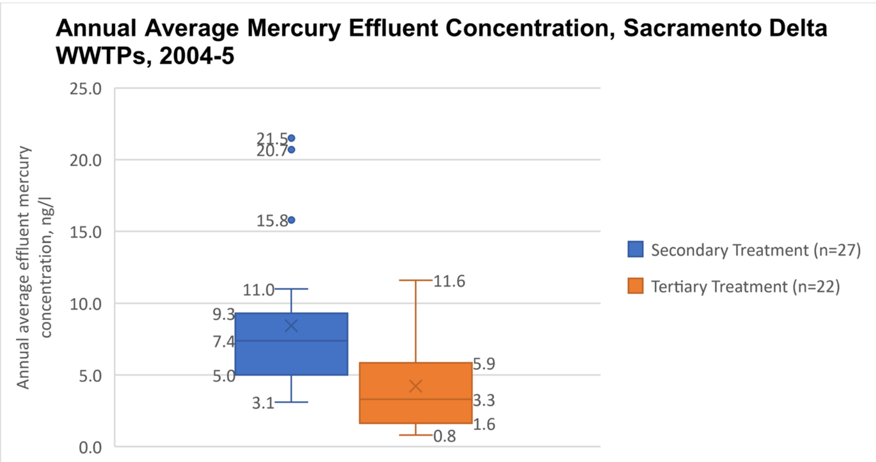

Figure 2.1. Average Total Mercury Effluent Concentration, Sacramento Delta WWTPs, 2004-5

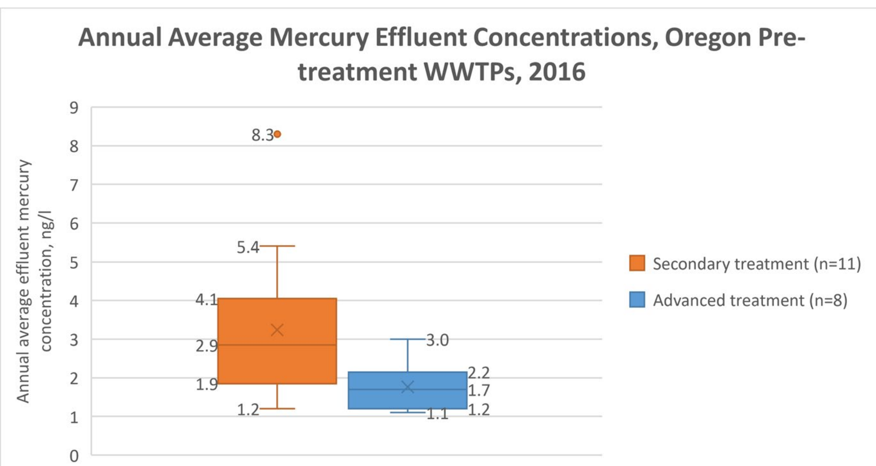

Figure 2.2. Average Total Mercury Effluent Concentrations, Oregon pre-treatment WWTPs, 2016

Note: The Oregon wastewater treatment facilities include in the advance treatment group (n=8) for this graphic include: Rock Creek and Durham operated by CWS, McMinnville, Wilsonville, Albany, Kellogg Creek, Newberg and Tri-cities. Only a portion of the Tri-cities WWTP flow is filtered after secondary treatment; however, the average mercury concentration in effluent in 2016 was 1.6 ng/l, comparable to other systems.

2.2 Review of Available Treatment Technologies

In its variance application, Clean Water Services provided the results of a literature review on the ability of available treatment technologies to remove mercury. CWS noted that their literature review did not identify pilot or full-scale treatment systems that would be able to achieve the current TMDL target of 0.92 ng/L, nor the lower water concentration target from the updated TMDL modelling of 0.14 ng/L.

Because there is a lack of full-scale installations consistently producing effluent mercury concentrations in the low ng/L range, it is difficult to predict whether it is possible to consistently achieve mercury concentrations in the low ng/L range on a long-term, large-scale basis. An Ohio EPA study[2] concluded that end-of-pipe controls to meet the mercury water quality standards of 1.3 ng/L would cause substantial and widespread economic impact *and the ability of the added controls to meet the standard was not known* (emphasis added). Michigan relied on the Ohio study to support their state's multiple discharge variance as well. In EPA's 2015 approval of Michigan's Multiple Discharge Variance, EPA concluded that the installation and operation of filtration technology short of reverse osmosis *cannot ensure compliance with a monthly average water quality based effluent limit of 1.3 ng/L* (emphasis added).

In Oregon, the WQBEL needed to meet the human health criterion is estimated to be 0.14 ng/L, an order of magnitude lower than the Ohio and Michigan standards. If the ability of the controls to meet 1.3 ng/L is not known, it is reasonable to conclude that the ability of the controls to meet 0.14 ng/L has not been demonstrated.

This information is consistent with a review conducted by HDR for the Association of Washington Businesses.[3] The HDR study examined the potential performance of adding reverse osmosis or granular activated carbon to the back end of a tertiary microfiltration process and hypothesized that such a treatment system *might* be able to remove mercury to a concentration of 0.12 to 1.2 ng/l. However, the study provided no data from any test or operational system. Such treatment systems had not at that time been employed on a bench or pilot scale, or at a wastewater treatment plant scale to DEQ's knowledge.

In addition, membrane filtration technologies have high energy costs, creating a substantial carbon footprint, and would need to dispose of the removed waste sludge[4]. According to a life cycle assessment performed for the Berlin-Ruhleben secondary wastewater treatment plant (63 MGD), the operational energy use of polymer ultrafiltration or ceramic microfiltration membranes would be 0.33 watt×hour/gal. This would represent approximately a 9 percent increase in that plant's existing global warming potential and does not include the additional global warming potential that would be contributed by infrastructure, chemicals for maintenance and any necessary coagulant (from CWS Variance Application, Attachment 1, p. 13). Of the different types of membrane filtration, reverse osmosis also has the large disadvantage of necessitating disposal of the concentrate stream, which can amount to approximately 5 to 20 percent of the influent.

EPA contracted with Battelle to complete a review of current wastewater treatment technologies for mercury and to update the 1997 Ohio EPA study. Battelle's 2013 draft report found that bench scale and pilot tests resulted in a concentration of 1.3 ng/L. However, little information is available for facilities actually implementing a technology to remove mercury from their effluent. Of the five facilities actively using the technology referenced in the report, only two had been in operation for over two years and these

Commented [A3]: There doesn't seem to be a footnote 4.

Commented [A4]: We believe this concentrate stream would be *instead of* the "removed waste sludge" referred to in the first sentence of this paragraph, not *in addition to*. It is true that precipitates sometimes form on the RO membrane; these can be removed by periodic cleaning with antiscalants. Typically, the volume of used antiscalant solution from these cleanings is small relative to the brine volume and the used solution is added to the brine for disposal.

[2] Ohio Environmental Protection Agency. 1997. Assessing the Economic Impacts of the Proposed Ohio EPA Water Rules on the Economy. Prepared for the Division of Surface Water by Foster Wheeler Environmental Corporation and DRI/McGraw Hill.

[3] Treatment Technology Review and Assessment, Association of Washington Businesses, HDR, Dec. 2013.

facilities have small discharges (0.035 MGD and 1.4 MGD). Although technology is advancing, it has not yet been demonstrated that the newer technologies can be successful at the scale needed for a large WWTF, with varying influent concentrations and design flows.[5]

A 2007 EPA report regarding mercury treatment notes that there are technologies, such as precipitation, filtration or other physical/chemical treatments (see Table 2.1) that might treat mercury in addition to those typically employed by wastewater treatment plants. However, these have been employed in industrial settings where influent concentrations were an order of magnitude higher than influent concentrations at municipal wastewater treatment facilities[6]. The effluent concentrations at many of these industrial applications were similar to the influent concentrations at municipal treatment facilities. Moreover, the information provided in the EPA report did not indicate flow volumes, so it is difficult to translate these studies to typically larger municipal wastewater treatment plant volumes.

In another study, an oil refinery evaluated various treatment technologies for wastewater with low (10 ng/l) mercury levels to determine the extent to which mercury concentrations could be lowered following conventional treatment. Bench scale tests of various adsorbent techniques showed that they could remove mercury to as low as less than 0.08 ng/l of total mercury[7]. Ultra- and micro-filtration tests also reduced mercury to less than 1 ng/l, although not as much as adsorption. However, such techniques have not been shown to work at the higher volume or the higher influent concentrations in municipal treatment. Moreover, they would be have to supplement existing treatment and would be energy intensive, generate additional waste and cost millions of dollars to install and operate[8].

Commented [A5]: An analysis of cost would need to be done to substantiate these claims.

Table 2.1 summarizes results from treatment technologies that have been tested at a small scale for municipal wastewater or used for water treatment or industrial wastewater treatment. None of these technologies have been demonstrated to be feasible for use at large municipal WWTFs and it is not known what effluent concentrations would be achievable if they were used for this purpose. Table 2.2 summarizes results from various technologies.

Table 2.3. Potential treatment technologies considered for mercury treatment

Study	Type of treatment technology	Influent total mercury concentration (ng/l)	Average effluent total mercury concentration (ng/l)	Percent removal	
EPA (2007)[9]	Precipitation (Chelator)	400-9,600,000	25-21,400	42-99.9%	Full scale
EPA (2007)[6]	Adsorption/ Granular Activated Carbon	3,300-2,500,000	300-1,000	99-99.8%%	Full scale

[5] Michigan Department of Environmental Quality. 2015. Mercury Multiple Discharge Variance Document.
[6] U.S. EPA. 2007. Treatment Technologies for Mercury in Soil, Waste, and Water. Office of Superfund Remediation and Technology Innovation. Washington, DC. 133 pp.
[7] Urgun-Demirtas, M, P. Gillenwater, M. C. Negri, Y. Lin, S. Snyder, R. Doctor, L. Pierece and J. Alvarado. 2013. Achieving the Great Lakes Initiative Mercury Limits in Oil Refinery Effluent. Water Environment Research 85(1): 77-86.
[8] Treatment Technology Review and Assessment, Association of Washington Businesses, HDR, Dec. 2013.
[9] U.S. Environmental Protection Agency. 2007. Treatment Technologies for Mercury in Soil, Waste, and Water. Office of Superfund Remediation and Technology Innovation. Washington, DC. 133 pp.

Study	Type of treatment technology	Influent total mercury concentration (ng/l)	Average effluent total mercury concentration (ng/l)	Percent removal	
HDR Study (2013)[10]	Tertiary Microfiltration/ Reverse Osmosis		0.12-1.2 hypothetically	>99%	Not demonstrated at WWTP scale
HDR Study (2013)	Tertiary Microfiltration/ Granular Activated Carbon		0.12-1.2 hypothetically	>99%	Not demonstrated at WWTP scale
Urgun-Demirtas, et al. (2013)[11]	Precipitation	10 ng/l	3.1 ng/l (before filtration) 0.17 ng/l (after filtration)	56.5% before filtration	Bench scale testing
Urgun-Demirtas, et al. (2013)	Adsorption	10 ng/l	<0.08 ng/l – 0.72 ng/l (lowest achieved)	92.8% - 99.2%	Bench scale testing
Urgun-Demirtas, et al. (2013)	Filtration	10 ng/l	0.26 – 0.34 ng/l (lowest achieved)	65 – 97% depending on pressure	Bench scale testing
Hollerman, et al. (1999)[12]	Adsorption	739-1447 ng/l	~25-340 ng/l	n/a	Low volume
Rock Creek AWWTF	Activated sludge with nutrient removal + filtration	78 (long term geometric mean)	1.6 (long term geometric mean)		Full scale municipal treatment facility

Table 2.4 Treatment capability of mercury technologies

Treatment Technology	Volume Range of Known Uses	Treatment Ability
Activated sludge	Up to 25 MGD	3-50 ng/L
Activated sludge w/ Nutrient Removal or Filtration	Up to 25 MGD	1-10 ng/L
Membrane Filtration	Low volume	Bench scale to 0.26 ng/L
Ion Exchange	0.015 MGD (5-50 GPM)	1 ng/L
Precipitation and filtration	Low volume	Bench scale to 0.17 ng/l; full scale to 25 ng/l
Adsorption	Low volume	Bench scale to 0.08 ng/l; full scale to 25 ng/l

[10] HDR. 2013. Treatment Technology Review and Assessment. Prepared for the Association of Washington Businesses.
[11] Urgun-Demirtas, M, P. Gillenwater, M. C. Negri, Y. Lin, S. Snyder, R. Doctor, L. Pierece and J. Alvarado. 2013. Achieving the Great Lakes Initiative Mercury Limits in Oil Refinery Effluent. Water Environment Research 85(1): 77-86.
[12] Hollerman, W., L. Holland, D. Ila, J. Hensley, G. Southworth, T. Klasson, P. Taylor, J. Johnston, and R. Turner. 1999. Results form the low level mercury sorbent test at the Oak Ridge Y-12 Plant in Tennessee. Journal of Hazardous Materials B68:193-203.

3. The Need for the Variance

In order to grant a variance to a discharger, DEQ must find that it is not feasible to attain the designated use during the term of the variance, often because the criterion established to support the designated use is not currently attainable. Federal regulations at 40 CFR 131.14(b)(2)(i)(A) specify seven factors that can be used to justify the need for a variance. A summary of the information that supports the need for a variance for the Rock Creek AWWTF is provided in Section 3.1 below. In addition, Section 3.2 summarizes the information DEQ considered to determine that it is not currently feasible for the facility to achieve a WQBEL based on the 0.14 ng/L translation of the criterion.

3.1 The Methylmercury Criterion and Fish Consumption Use are Not Currently Attainable

In their variance application for the Rock Creek AWWTF (Attachments 1 and 2), CWS provides information and data that, together with the information from the mercury TMDL update, demonstrates that the methylmercury criterion is not currently attainable in the Tualatin River due primarily to the atmospheric deposition of mercury in the watershed. The atmospheric deposition of mercury is a human-caused condition that cannot be remedied by the discharger or the State during the term of the requested variance (Factor 3). The ubiquitous nature of the mercury levels in atmospheric sources not only in Oregon but across Western North America, support this conclusion. In addition, there are natural geologic sources of mercury that occur in Oregon soils and water that also cannot be controlled by the discharger or the state during the term of the variance at levels to meet Oregon's methylmercury criterion.

The information provided below demonstrates the need for the variance based on CFR 131.10(g)(3), human-caused pollution that cannot be remedied or would cause more environmental damage to correct than to leave in place. Although the designated use and associated criterion are not attainable during the term of the variance, the discharger will continue to implement a mercury minimization program that will reduce human-caused sources of ~~the~~ mercury to achieve the greatest pollutant reductions possible. Therefore, a variance is an appropriate Clean Water Act tool for this facility.
The following data and information support the need for the Rock Creek AWWTF variance by demonstrating that the mercury criterion is not attainable in the waterbody during the term of the variance and the sources of mercury are outside the control of the discharger:

1. Data for the Tualatin River show that water column concentrations of total mercury upstream of ~~first CWS WWTF~~point source discharges are 1.5 ng/L as the geometric mean with a standard deviation of 2 ng/L and a maximum over 9 ng/L (n=25). These values exceed the water concentration value (0.14 ng/L) needed to meet the fish tissue criterion. Mercury concentrations at the furthest downstream sampling location, below all four WWTFs, are 1.8 ng/L as a geometric mean, with a standard deviation of 1.4 and a maximum of 6.4 ng/L (n=44). See Figure 3.1 below (From the CWS Mercury Variance Application, Figure 6 and Table 6, page 17, Attachment 1).
2. Data from Oregon show that fish tissue levels of methylmercury from locations across the state exceeded the criterion of 0.04 mg/kg in a large majority of samples. See Figures 3.2 and 3.3 below from DEQ's Statewide Aquatic Tissue Toxics Assessment Report[13]. The exceedances

[13] DEQ August, 2017. Statewide Aquatic Tissue Toxics Assessment Report (p.12). http://www.oregon.gov/deq/FilterDocs/wqmtissueaq.pdf

Commented [A6]: Since this is a translation of the criterion, this type of term should be added each time it's used. Or add in the actual criterion ie 0.04 mg/Kg fish tissue.

Commented [A7]: Is this an attachment? Where can this be reviewed? Should be part of the record that is provided for public review.

Commented [A8]: Need to provide more information on how these natural geologic sources of mercury are entering the water.

Commented [A9]: It is important to be specific to Oregon's criteria.

Commented [A10]: These may not be the right words but if we want to combine the fact that they already have high levels of control with their technology and PMP as part of the rationale, then perhaps something like this should be here?

Commented [A11]: The discharger is still a source of mercury to the waterbody downstream of the outfall. It would be more transparent to say something like "even without the discharger's mercury load, the mercury criterion is not attainable in the waterbody during the term of the variance due to sources of mercury outside the control of the discharger that cannot be remedied. The discharger's contribution of Hg will be reduced to the maximum extent feasible through implementation of the PMP, as described below."

Commented [A12]: Assuming this is true? If not please discuss what point sources are upstream and their contributions of mercury.

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occur in remote as well as developed areas, indicating that elevated mercury in fish tissue is a ubiquitous problem across Oregon and is not associated with active point source discharges.

3. The 2006 Willamette Mercury TMDL found that all the WWTF discharges in the Willamette basin together contributed only 2.7% of the total mercury load to the Willamette River, or about 3.5 kg/year out of a total mass load of 128.5 kg/year. The TMDL is currently being updated. More recent modeling for the TMDL update confirms that municipal dischargers contribute a very small portion of the mercury load to the River.
4. Based on modeling and other analyses, the 2006 TMDL identified runoff of atmospherically-deposited mercury (41.8%) and erosion of native mercury containing soils (47.8%) as the two largest contributors of mercury to the river (p.3-21)[14]. While the relative contribution of these sources may be somewhat different for the Tualatin River than the main stem of the Willamette River, it is reasonable to expect that the point sources similarly contribute a very small portion of the total mercury load to the waterbody.

The following information also support the conclusion that atmospheric deposition is largely preventing the attainment of the use and that mercury sources cannot be remedied by the discharger or the state during the term of the variance to the level needed to meet OR's mercury criterion.

1. Data from the western U.S. and Canada show that Oregon's fish tissue criterion for mercury (0.04 mg/kg) is exceeded in most locations where the data is available. The problem is ubiquitous across the landscape and not limited to areas below point source discharges or where there is urban development (see Figure 3.4 below and Attachment 2).

2. Data from the Mercury Deposition Network and the scientific literature cited in Attachment 2 demonstrate that mercury is present in precipitation and that mercury is deposited onto Oregon waters and watersheds (commonly referred to as "atmospheric deposition") (see Figure 3.5).

3. Atmospheric sources of mercury deposited into waterways or onto the landscape in the Willamette Basin and throughout Oregon are primarily from sources outside of the state and outside the control of the state (see literature cited in Attachment 2 and Amos et al, 2013). The paper by Amos et al[15] predicts that, on average, the amount of mercury in the atmosphere that is of purely natural origin is 13% of the total. In the terrestrial environment, this value increases to 17%. As such, >80% of the Hg cycling in the environment is thought to be due to anthropogenic activities and <20% from natural geologic sources. Atmospheric mercury and its deposition is, therefore, outside the control of the discharger and the State of Oregon. Oregon has identified two significant sources of mercury releases to the air within the state and both of these sources are being reduced or eliminated.

4. According to the updated TMDL information, the median total mercury concentration in the Tualatin basin is 2.67 ng/L (based on 18 samples collected from 2002-2017), and a 95% reduction is needed to meet the water concentration target of 0.14 ng/L total mercury. While the state does have some control over the transport of mercury from the land to state waters through nonpoint source pollution control programs, it is a process that will take time. This amount of reduction is not feasible within the term of the variance, even under an aggressive program to prevent runoff and erosion of mercury from the landscape into Tualatin River. This information

[14] DEQ 2006. Willamette Basin TMDL, Appendix B: Mercury. https://www.oregon.gov/deq/FilterDocs/appxbmercury.pdf
[15] Amos et al, 2013. Legacy impacts of all-time anthropogenic emissions on the global mercury cycle. BIOGEOCHEMICAL CYCLES, VOL. 27, 410–421, doi:10.1002/gbc.20040

Commented [A14]: ..not *soley* associated with active ps discharges?

Commented [A15]: Can we quantify this with mass loading or percentage?

Commented [A16]: Can you add in the information from the new modeling? This seems dated since work has been completed to update the TMDL and we should use updated information.

Commented [A17]: This is contradicted by the next sentence, as some mercury is coming from within the state.

Commented [A18]: These sources should be discussed further and the reduction/elimination of the discharges should be quantified.

Commented [A19]: Citations?

Commented [A20]: What reduction is feasible? What is the state committing to do to improve runoff/erosion both within the term of the variance and beyond?

supports the conclusion that the sources of mercury to the Tualatin River cannot be controlled by the discharger or the state during the term of the variance to the full extent needed to meet OR's mercury criterion.

In addition, there are natural sources of mercury in the atmosphere and in the basin geology and soils that contribute to the mercury concentrations in the Tualatin River. These sources also cannot be controlled by the discharger or the state during the term of the variance.

Commented [A21]: More detail needs to be given here

DEQ expects that management practices to control erosion and rainwater runoff can reduce the movement of mercury from the land into the water. This provides some opportunities for the state to implement programs that will help to reduce mercury by promoting erosion and runoff control practices, and the nonpoint sources of mercury transport will be addressed by the TMDL currently under development. This may also provide opportunities through mercury minimization plans for municipal sources to investigate and implement BMPs within their jurisdiction. However, the movement of rainwater and soil into streams across the landscape is largely outside the control of municipal dischargers during the proposed term of this variance.

Commented [A22]: But the state might be able to do something, right? If not, why?

In summary, based on the information summarized above, DEQ concludes that Oregon's fish tissue criterion for methylmercury, and thus the fish consumption (fishing) use, is not currently attainable in the Tualatin River. There is sufficient data and information to demonstrate that mercury is a human caused condition that cannot be remedied in the Tualatin River through the implementation of Clean Water Act requirements by CWS or the State within the timeframe of the variance. Based on the data and literature, mercury levels in the Tualatin River result primarily from sources other than municipal WWTF discharges. The majority of the mercury is from the deposition of atmospheric mercury that originates outside the basin or the State. These findings justify the need for a variance for the Rock Creek AWWTF, consistent with 40 CFR 131.10(g)(3).

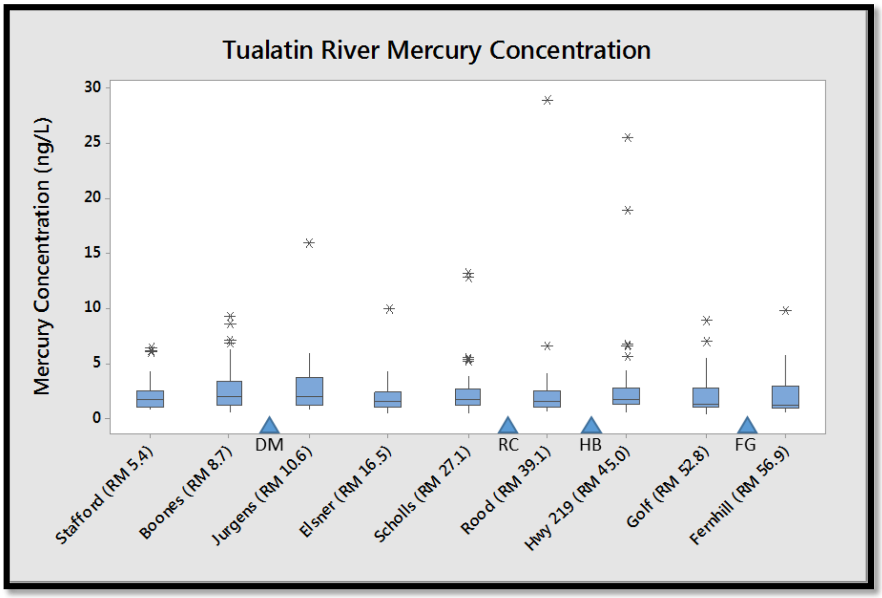

Figure 3.1. Mercury Concentrations in the Tualatin River.

From the Clean Water Services Variance Application, July 2017 (Attachment 1). The triangles along the bottom represent the locations of the four CWS WWTFs.

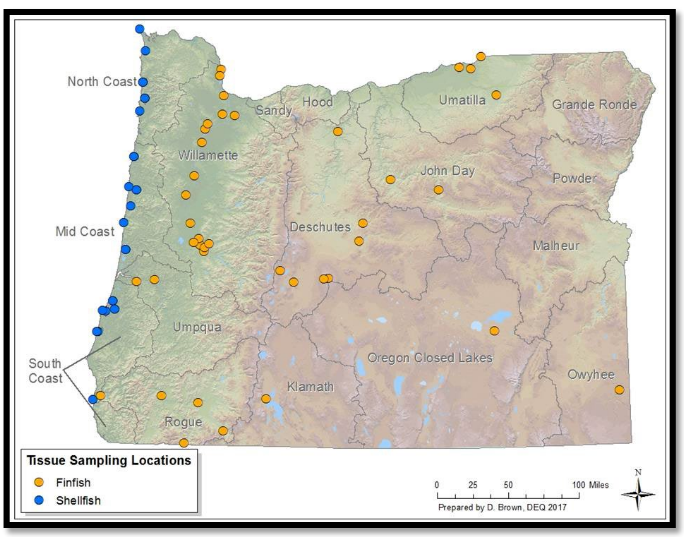

Figure 3.2. Tissue sampling sites (2008-2015).

From DEQ's Statewide Aquatic Tissue Toxics Assessment Report (ODEQ, 2017, p. 2).

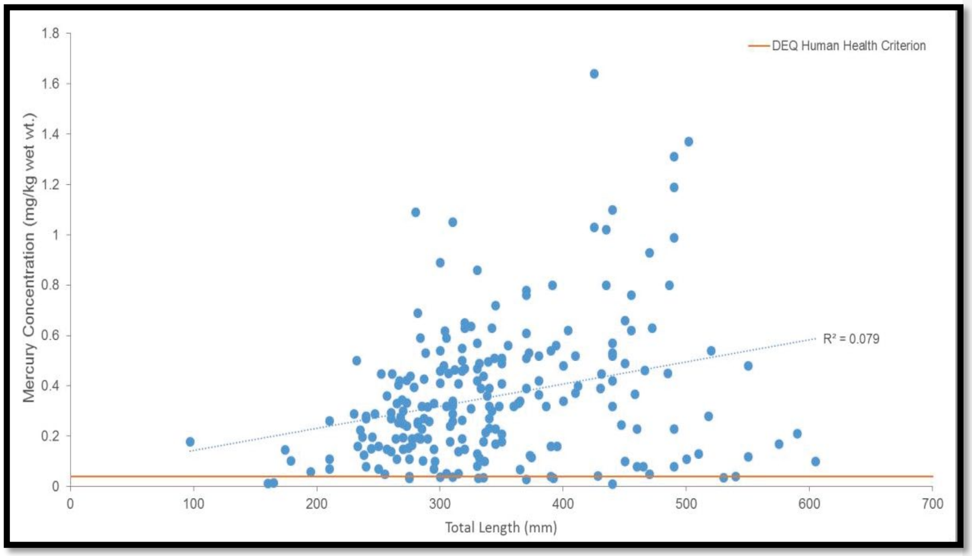

Figure 3.3. Mercury concentration (mg/kg wet weight) in skinless finfish fillets compared to total length (mm).

The orange line indicates the DEQ human health criterion for methylmercury (0.04 mg/kg fish tissue). (ODEQ, 2017, p. 13, Figure 10.) Please note that regardless of size, most fish tissue concentrations exceeded the methylmercury criterion.

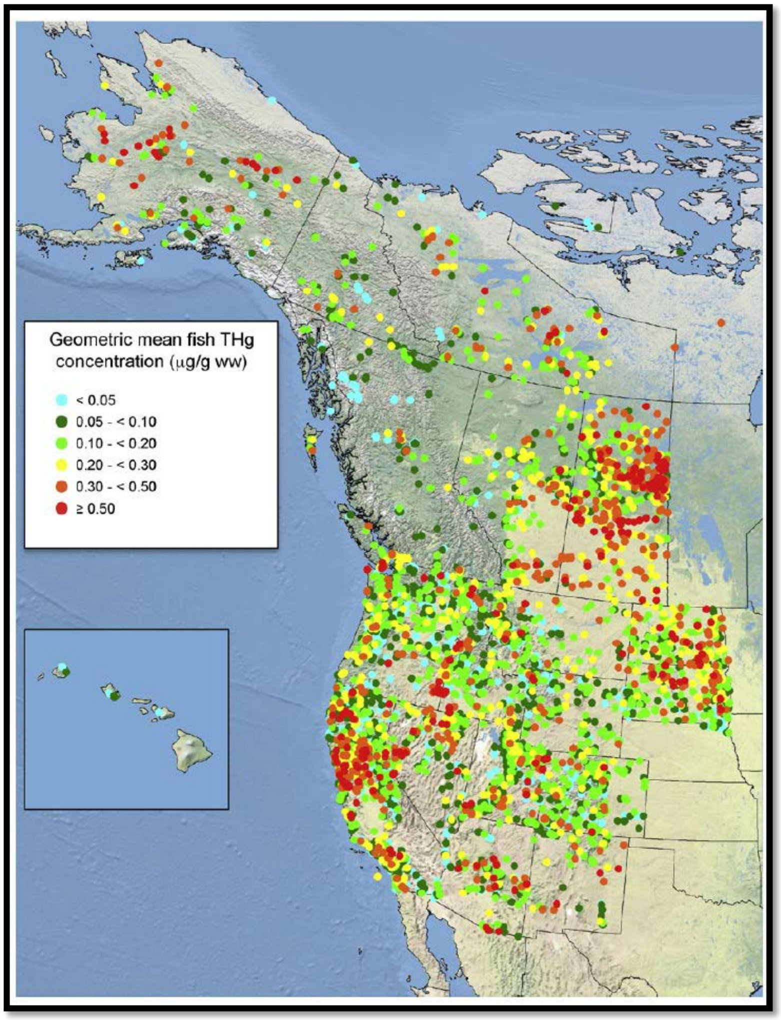

Figure 3.4 Geometric mean of fish tissue concentrations by site.

Note that µg/g is equal to mg/kg. Only locations with turquoise dots would have geometric means close to the 0.04 mg/kg standard. From Eagles-Smith et al., 2016b (Figure 9). Provided by CWS, see Attachment 2.

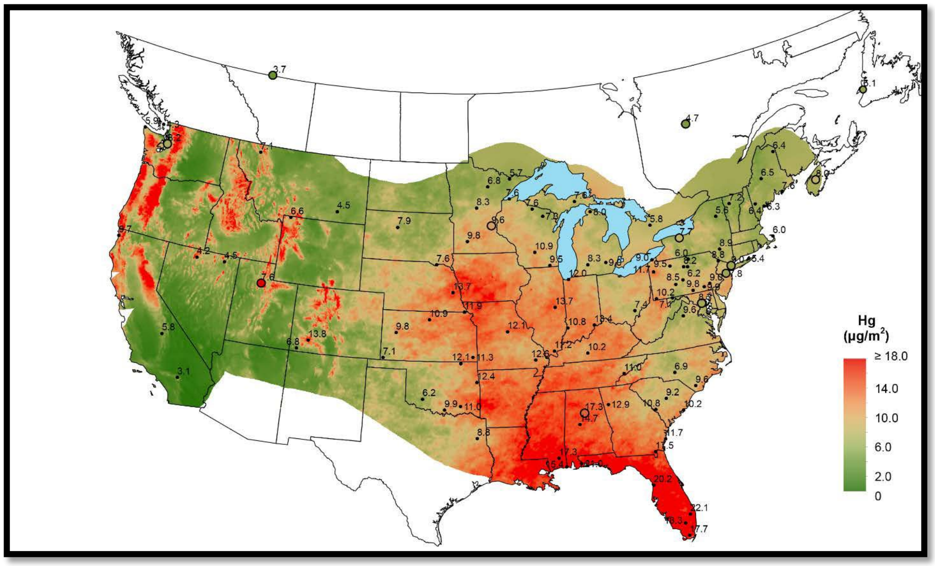

Figure 3.5. Total Mercury Wet Deposition in 2014 (Mercury Deposition Network, 2017

(Provided in CWS Variance application supplemental information, Attachment 2.)

3.2 The Water Quality Based Effluent Limit is Not Achievable

There are no technology-based effluent limits or effluent guidelines for mercury. Therefore, NPDES permits limits for mercury are evaluated based on the water quality criterion. Because total mercury levels in the Tualatin River exceed the water concentration needed to meet the methylmercury criterion, dischargers would be required to achieve an effluent concentration equal to the water concentration target of 0.14 ng/L, before the effluent is discharged to the receiving water.

The Rock Creek AWWTF is an advanced secondary treatment facility. The facility employs a biological treatment process that consists of an activated sludge biological treatment system with nutrient removal and filtration. This treatment technology is very effective at removing mercury. CWS reports in their variance application that the average mercury removal efficiency at the Rock Creek AWWTF is approximately 98 percent and the long-term geometric mean effluent concentration is 1.6 ng/L. The summary statistics in Table 3.1 were provided by CWS based on data they collected from 2005 to 2017 (Attachment 1 pages 2 and 14). The Rock Creek effluent is further characterized in Chapter 4 below based on data from 2013-2018. Despite the advanced treatment system currently in place at the Rock Creek facility, it cannot achieve the effluent concentration of 0.14 ng/L needed to meet Oregon's water quality criterion.

In their variance application, CWS concludes that it is not feasible to attain an effluent limit of 0.14 ng/l by installing additional demonstrated treatment technology (Attachment 1, pages 13 and 14). In their review, CWS was not able to identify any treatment technology being used at a municipal wastewater treatment facility that can achieve effluent mercury concentrations of 0.14 ng/L total mercury.

Table 3.5 Rock Creek Effluent Mercury Summary Statistics

Statistic	Value
Number of Samples	174
Geometric Mean (ng/L)	1.6
Arithmetic Mean (ng/L)	1.8
Maximum (ng/L)	5.1
Standard Deviation	0.93
Coefficient of Variation	0.51
Annual Average Flow (MGD)	57.4
Mass Load (lbs/year)	0.28

Based on the CWS Variance Application (Attachment 1) and the information cited and summarized in the technology review provided in Chapter 2 above, DEQ concludes that the Rock Creek AWWTF cannot feasibly achieve a WQBEL of 0.14 ng/L. They cannot achieve this concentration using their current advanced treatment technology and there is no additional demonstrated treatment technology that can consistently achieve the WQBEL 0.14 ng/L in municipal wastewater at the facility scale. Therefore, a variance for the Rock Creek AWWTF is needed and appropriate.

4. The Requirements of the Variance

4.1 Highest Attainable Condition

After determining that a variance is needed and appropriate, the next step is to determine the requirements of the variance. The variance must include requirements to achieve the highest attainable condition (HAC) during the term of the variance. The HAC may be expressed using one of three options provided in the federal regulations at 40 CFR Part 131.14(b)(1)(ii). HAC Option 1 is an alternative water body criterion. DEQ will not use HAC 1 because this is an individual variance and because the information needed to establish an alternative water body criterion is not readily available. ~~Rather, DEQ will focus on what is achievable for the discharger using HAC Options 2 or 3, which express the highest attainable effluent condition during the term of the variance.~~

HAC Option 2 identifies "the interim effluent conditions that reflects the greatest pollutant reduction achievable." HAC Option 3 expresses, "if no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the variance and the adoption and implementation of a Pollutant Minimization Plan." (CFR 131.14(b)(ii)(A). Neither option shall result in a lowering of the currently attained water quality.

Although the term of the variance may be longer than five years, federal regulations specify that the HAC must be re-evaluated at least every five years. The preamble in the Federal Register for the proposed federal variance rule (FR Vol. 78, No. 171, September 4, 2013, p.54534) noted that the requirement to identify the HAC and to periodically re-evaluate the HAC ensures that there will be feasible progress towards attaining the designated use. The preamble in the Federal Register further explains that establishing interim requirements allows states to implement adaptive management approaches that drive progress towards meeting the designated use in a transparent and accountable manner.

DEQ has determined that the HAC Option 3 is appropriate for the Rock Creek AWWTF. HAC Option 3 expresses, "if no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the variance and the adoption and implementation of a Pollutant Minimization Plan." (CFR 131.14(b)(ii)(A)). The supporting information for this determination is summarized in this Section (4.1). Section 4.2, below, describes the highest attainable effluent condition for the Rock Creek AWWTF based on the existing pollutant control technologies in a well-maintained and operated facility, which we call the Level Currently Achievable (LCA). Section 5 below discusses the MMP.

The reasons DEQ concludes that HAC Option 3 is appropriate and justified for the Rock Creek AWWTF variance include the following:

1. No pollutant control technology has been identified that has been demonstrated to be feasible on the scale of a municipal wastewater treatment facility that would reliably achieve a WQBEL of 0.14 ng/L total mercury. See the discussion of treatment technologies in Section 2.2 above.
2. No pollutant control technology has been identified that has been demonstrated to be feasible on the scale of a municipal wastewater treatment facility that would achieve significantly greater pollutant removal or lower effluent mercury concentrations than the treatment system currently

Commented [A23]: Suggest deleting. Explanation of HAC1 and HAC2 is not needed when the variance is for HAC3 and it may confuse the reader.

Commented [A24]: You mean preamble? If not, please clarify.

Commented [A25]: This paragraph seems out of place…not sure why it's in the middle of the HAC Options discussion? Would suggest removing, or shifting to Section 6 if needed.

installed at the Rock Creek AWWTF. See the discussion of the performance of the Rock Creek AWWTF in comparison with other demonstrated treatment systems in Section 4.2 below.

3. DEQ expects that it will be more cost effective to obtain additional feasible reductions in mercury discharges through Industrial Pretreatment and Mercury Minimization Programs than through the additional treatment of millions of gallons of effluent per day.
4. In addition, it is reasonable to expect, as other states have, that mercury reduction programs have less environmental impact than treating a large volume of wastewater with technologies such as microfiltration or reverse osmosis that use large amounts of energy and generate a sludge that must then be disposed of elsewhere in the environment. Hydroelectric power, another source of energy generation in the Northwest, negatively impacts native salmon and steelhead. Multiple Biological Opinions written by the National Marine Fisheries Service on the Columbia, Snake River and Willamette River identify the impacts of dams on ESA listed salmon and steelhead populations.
5. Conversely, because the mercury load from the Rock Creek facility is a very small portion of the total load of mercury to the river, additional treatment would not be expected to significantly reduce mercury levels in the receiving water.
6. DEQ expects that CWS's ongoing Pretreatment Program and Mercury Minimization Program will maintain and improve upon their mercury reduction efforts over the term of this variance with little or no associated environmental impact. These efforts, in addition to reducing the mercury load in the WWTF effluent, may have the added benefits of reducing mercury loading to the Tualatin River through other pathways and reducing mercury releases to the environment generally. See Chapter 5 for further discussion of the CWS Mercury Minimization Program.

Commented [A26]: These points help bolster your overall justification but will not work as stand alone arguments for facilities without advanced treatment.

During the 2015 revision of Michigan's Mercury MDV, Michigan and EPA agreed that generally, end-of-pipe treatment for mercury is not the most cost-effective method to reduce mercury loadings in Michigan waters, and that pollution prevention and waste minimization programs for mercury should be the first steps for restoring water quality before considering extraordinary treatment alternatives. EPA concluded that the: "installation and operation of filtration technology generally costs more than implementation of PMPs, uses more energy than PMP implementation, does not result in greatly improve effluent quality…, and simply captures mercury in solids that are then typically land-applied."[16] (Page 13)

Commented [A27]: MI's MDV came in just in time to not be reviewed under 131.14. So the review was based on 132 Appendix F, Procedure 2, which doesn't have the same "additional feasible pollutant control technology" language as 131.14, and should not be used as a direct comparison.

4.2 Additional Feasible Pollutant Control Technology

In order to use HAC Option 3, the applicant must demonstrate that no additional feasible treatment technology can be identified that would achieve greater pollutant reduction than the currently installed well-operated and maintained treatment system can achieve ~~when it is well-maintained and operated~~. If there is feasible treatment technology that would achieve a lower effluent concentrations than~~t~~ the current treatment system, then the facility must determine whether the additional treatment or a pollutant minimization plan would achieve greater pollutant reductions.

Commented [A28]: The point made above is that there is NO additional feasible treatment technology. If that is the case, then this section is confusing. Would recommend deleting.

[16] EPA's Review of the Michigan Department of Environmental Quality Request for Approval of a Multiple-Discharger Variance from Water Quality Standards Under Section 303 (c) of the Clean Water Act, WQSTS # MI2015-622. Dec. 8, 2015.

CWS concluded that their existing treatment system provides results comparable to or better than the alternative full scale or pilot-scale treatment technologies, particularly given the low influent concentrations that have resulted from CWS's source control efforts.

The Rock Creek AWWTF employs a biological treatment process that consists of an activated sludge biological treatment system with nutrient removal and filtration. This treatment technology is very effective at removing mercury. The average mercury removal efficiency at the Rock Creek AWWTF is approximately 98 percent and the long-term geometric mean effluent concentration is 1.6 ng/L, based on data from 2005 – 2017, as shown in Table 3.1 above (from the CWS variance application, Attachment 1). Table 4.1 below describes the performance of the Rock Creek AWWTF based on data reported to DEQ for the last 5 years (2013 to 2018).

The annual average effluent mercury concentration values in Table 4.1 range from 1.0 to 2.2 ng/L. The five-year average and geomean are 1.4 and 1.2 ng/L, respectively. Based on this data and the information in Section 2.1 regarding available treatment technologies, DEQ concludes that there is no demonstrated additional treatment available to CWS that would reliably reduce effluent mercury concentrations below the levels being achieved with the current advanced secondary treatment system. In comparison to advanced secondary systems in Oregon, and to tertiary systems in California (as shown in Figures 2.1 and 2.2 above), the Rock Creek AWWTF is performing better than average. As such, there are not demonstrated municipal systems that are consistently performing significantly better.

DEQ must review this conclusion each time the HAC is re-evaluated (e.g. upon permit renewal or at least every 5 years). If there is additional treatment technology has become feasible, then DEQ must determine whether the additional treatment would achieve greater mercury reduction than the current technology together with the mercury minimization program.

Table 4.6 Rock Creek AWWTF Effluent Mercury Concentrations, 2013 – 2018

Year	Annual Average Total Mercury (ng/L)
2013	2.2
2014	1.0
2015	1.4
2016	1.2
2017	1.1
2018	1.5

Summary Statistics (ng/L Total Mercury)	
Average	1.4
Max	4.2
Min	0.5
99%	3.9
95%	3.3
Geomean	1.2

Percent Removal of Total Mercury from Influent the Effluent	
Average	97.8 %
Geomean	97.8%
Maximum	99.9%
Minimum	93.0%

4.3 The Highest Attainable Effluent Condition

As discussed above, DEQ has determined that it will express the HAC using Option 3 as follows: 1) the interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the water quality standard variance, which we will refer to as the Level Currently Achievable (LCA), and 2) the adoption and implementation of an MMP. The LCA is the effluent condition achievable using the currently installed treatment system when it is optimized (i.e., well-operated and maintained). Establishing a permit limit based on the LCA ensures that the facility will achieve the highest effluent quality feasible with their existing treatment systems throughout the term of the variance.

According to federal regulations and guidance, and as a result of litigation on mercury issues in Michigan, the HAC assigned under a variance must be based on discharger specific data. Table 4.~~1~~ 6 above describes the mercury removal performance of the Rock Creek AWWTF based on the last 5 years of data (Q1 2013 through Q1 2018). These data describe the facility's highest attainable effluent condition using multiple statistics, including the average condition and the range of conditions. The full effluent data set is shown in Figures 4.1 and 4.2 below. The average annual total mercury concentration in the effluent ranges from 1.0 to 2.2 ng/L. The 95th and 99th percentiles of the five year data set are 3.3 and 3.9 ng/L, respectively.

An effluent limit for mercury will be calculated as part of the Rock Cr. AWWTF permit reissuance. DEQ is developing a procedure to derive the regulatory permit limit based on the LCA and the specific data for the facility shown in Figure 4.1 and summarized in Table 4.6~~1~~. There is variability in the effluent concentrations even when a facility is well maintained and operated. This variability must be accounted for to ensure that the facility is not inadvertently placed in noncompliance as a result of normal variation in effluent levels. In addition, the permit limit will depend on the monitoring frequency required. At present, DEQ expects to require quarterly monitoring, consistent with past practice and with the implementation of EPA's 2010 methylmercury implementation guidance.

The goal of the permit limit is to ensure that the facility continues to achieve its current effluent quality and reduces mercury levels in the effluent and/or the receiving water through their MMP. The HAC will be re-evaluated upon permit renewal or at a minimum, every 5 years to evaluate the progress being achieved through the MMP and to identify whether there are additional feasible actions that can be taken to reduce mercury. The MMP must also be submitted for public review and comment during the permit renewal process. This adaptive management process will allow the facility to make progress toward the standard in a feasible way that is transparent to the public.

Commented [A29]: The HAC must be quantifiable. The litigation reference is out of place, should discuss the federal regs, and provide a citation.

Commented [A30]: I don't think this huge range of data is the highest attainable effluent condition. Need to provide more detail on which value will be used as the HAC (95th or 99th percentile or….) and provide detail as to the rationale.

Commented [A31]: In the first paragraph it defines the LCA as the interim effluent condition that reflects the greatest…..

In the second paragraph it is stated that the data Table in 4.6 describe the facility's highest attainable effluent condition. So to that would mean the data in Table 4.6 is the LCA?

And in this sentence it seems that it's saying that the LCA is different than the data in 4.6.

Need to clarify what the HAC is and use clear language to support it.

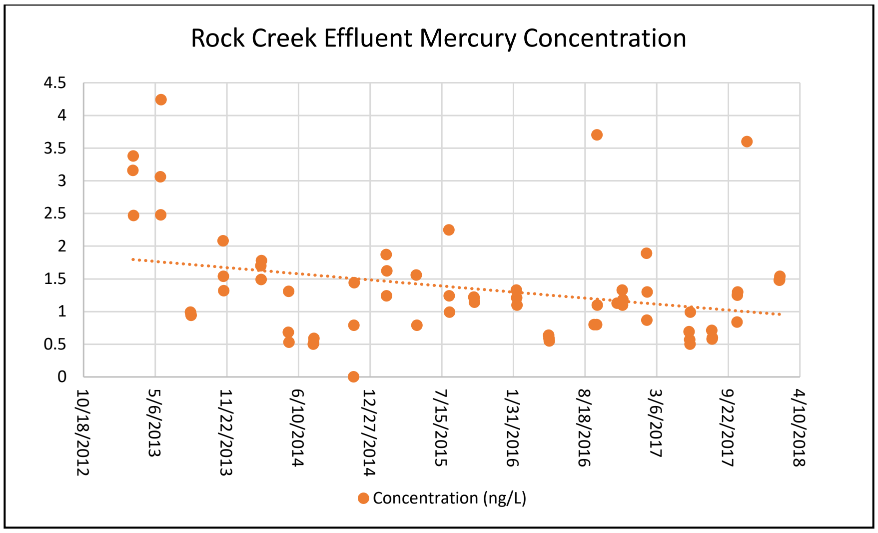

Figure 4.1. Rock Creek AWWTF Effluent Total Mercury Concentrations, ng/L, 2013 to 2018

Note: The dotted line is the logarithmic trend in mercury concentration.

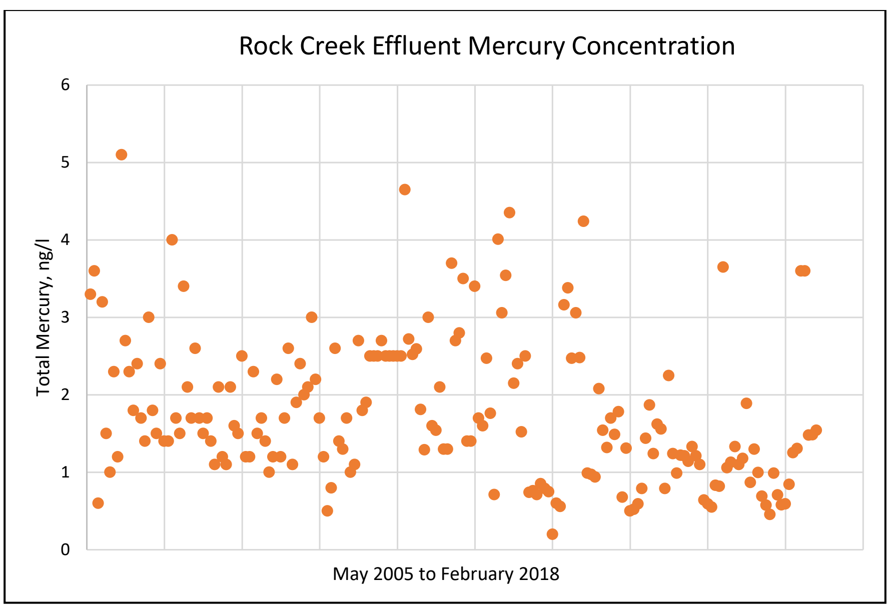

Figure 4.2. Rock Creek AWWTF Effluent Total Mercury Concentrations, ng/L, 2005 to 2018

5. Mercury Minimization Program

In addition to the numeric effluent limit, the permit will require that Clean Water Services implement a Mercury Minimization Program (MMP), in conjunction with their Industrial Pretreatment Program. The goal of the permit requirements is to maintain mercury reductions accomplished to date and continue progress toward the water quality criterion. Together, the MMP and the LCA ~~permit limit~~ define the highest attainable condition during the term of the variance.

In addition to the numeric interim effluent condition, the variance under HAC3 requires that Clean Water Services implement a Mercury Minimization Program (MMP), in conjunction with their Industrial Pretreatment Program. The goal of the HAC requirements is to maintain mercury reductions accomplished to date and continue progress toward achieving the underlying designated use and water quality criterion. Together, the MMP and the interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the variance define the highest attainable condition during the term of the variance.

CWS has been working to reduce mercury in their source collection area since 1992. Initially, CWS implemented a pretreatment program to limit inputs of mercury from industrial sources into their municipal treatment system. Later, they implemented programs to minimize non-industrial sources of mercury, such as dental offices. CWS provided data in their variance application showing the reductions they have achieved in influent mercury concentrations and biosolids concentrations. See Figures 5.1, 5.2 and 5.3 below (also in Attachment 1 page 12).

The effectiveness of CWS's minimization efforts can also be evaluated relative to the performance of other communities where MMPs have been in place for a decade or more. In Minnesota, the average influent mercury concentration was approximately 200 ng/L when they began their program and, by 2017, the average concentration had been reduced to an average in the range of 60 to 80 ng/L (See Figure 5.4 below). As can be seen in Figure 5.1 and 5.2 below (Figure 4 from the CWS application, Attachment 1), the average influent concentration for Rock Creek is presently between 80 and 90 ng/L, indicating the relative maturity of their source reduction program.

In 2015, CWS described their various past and proposed future mercury reduction efforts in a formal plan. The implementation of this plan was included as a requirement of their current permit, which was issued in April 2016. CWS has updated their MMP to maintain past reduction efforts and make further progress toward reducing mercury levels in their effluent and in the Tualatin River throughout the term of the variance. A summary of the CWS MMP is provided in Table 5 below. The full updated MMP may be found on the CWS website at: http://cleanwaterservices.org/media/1443/mercury-minimization-plan.pdf. (need updating)

In addition, CWS performed an audit of their internal operations, looking for mercury sources. The audit focuses on replacing equipment and chemicals that contain mercury and identifying additional opportunities to reduce mercury. CWS is currently following up on recommendations regarding waste management in their laboratory. Included in the recommendations is an investigation of lab analyses that use mercury-containing compounds.

MMP progress reports will be included in CWS' Pretreatment Annual Report. At this time, CWS has a staff person assigned to work on MMP implementation, and they also use temporary staff to conduct dental inspections and a contractor to do the laboratory outreach work.

Commented [A32]: Suggest paragraph updates below and delete this paragraph.

Commented [A33]: MMP for the HAC should be new/additional activities, so I'm not sure this is relevant.

Commented [A34]: It did not seem that the MMP at the website cited was updated since 2015?

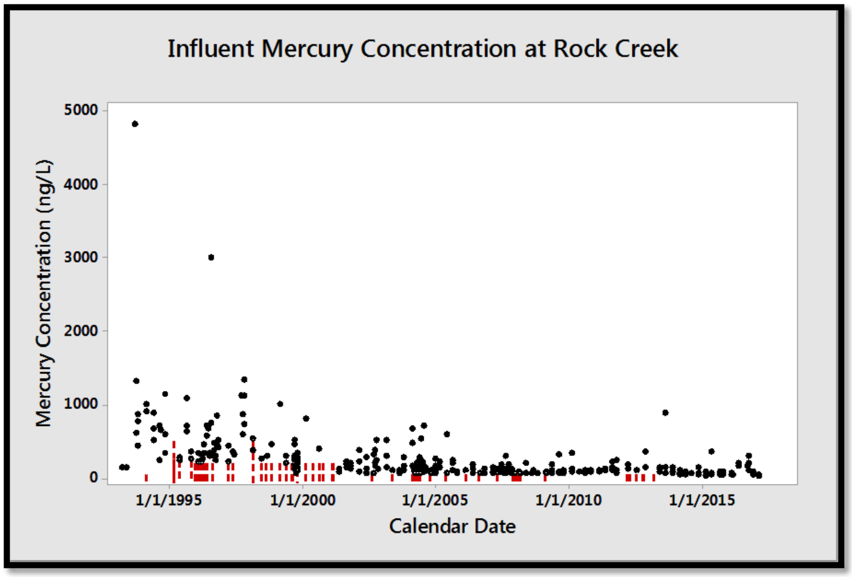

Figure 5.1. Influent Mercury Concentration at the Rock Creek AWWTF

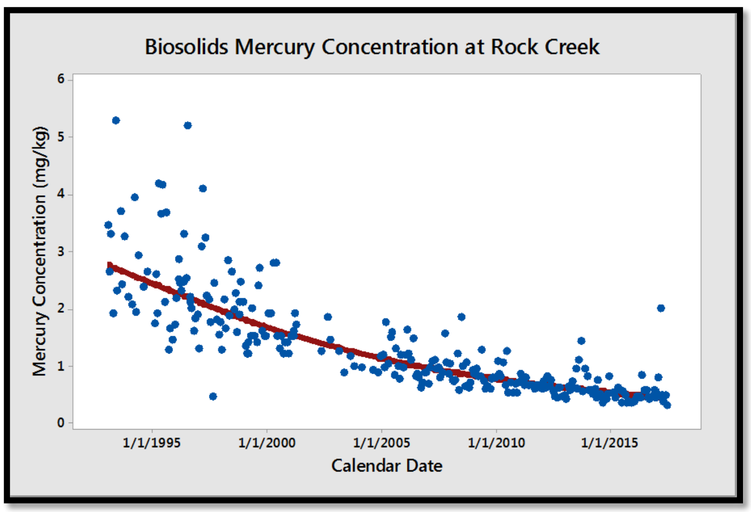

Figure 5.2. Biosolids Mercury Concentration at the Rock Creek AWWTF

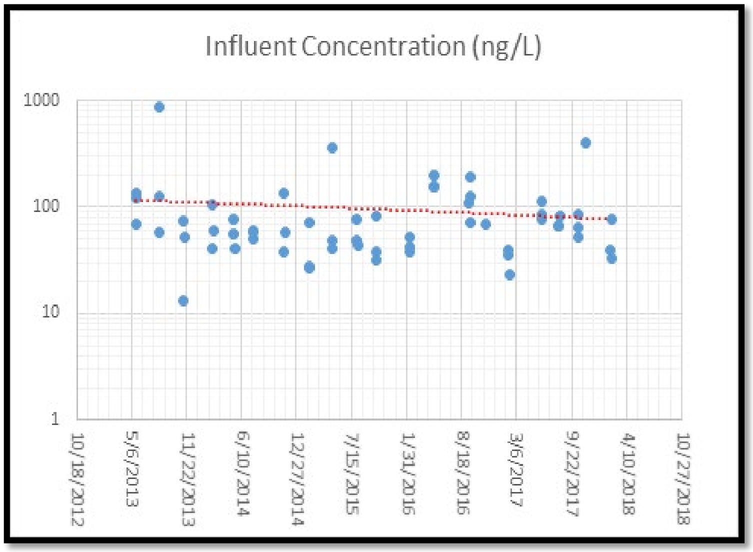

Figure 5.3. Rock Creek AWWTF Influent Mercury Concentrations, 2013-2018

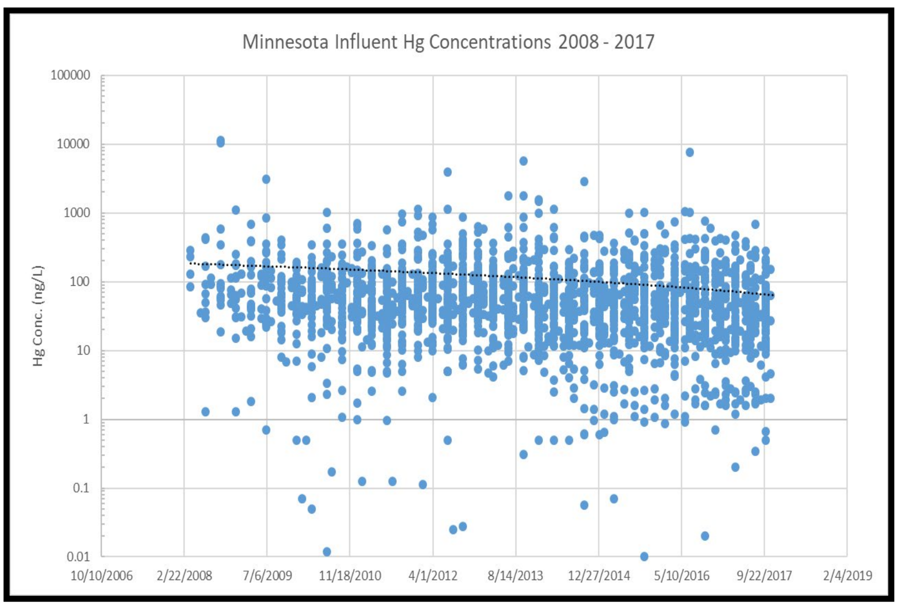

Figure 5.4. Influent Data from Major Wastewater Treatment Plants in Minnesota.

(Source: Minnesota Pollution Control Agency.)

Table 5.7 Mercury Minimization Program: Five-Year Summary of Activities and Strategies in Clean Water Service's 2019 Mercury Minimization Plan

Commented [A35]: Confirm that this means MMP for five years from start of variance (it appears that way from the "timeline" column). Suggest taking "2019" out of the title.

Sector	Activity	Performance Measures	Timeline	Goal
Medical	Interviews with EHS or sustainability coordinators from major hospitals in Washington County (i.e. Providence, Tuality, Legacy, Kaiser)	Report on status of mercury-free mandates in the health-care industry in Oregon	Completed within 2 years (from date permit reconsideration complete)	Product substitution, spill and waste management.
	Outreach materials	If gaps are identified, outreach materials will be developed	Completed within 5 years	Product substitution, spill and waste management.
Dental Offices	Develop a prioritized implementation strategy for on-going dental inspections	Inspections of dental office inventory, 20% annually, including follow-up on noncompliances	Inspections completed within 5 years, to be reported in annual Pretreatment Program annual report	Compliance with local, state and federal dental regulations
	Implement federal rule	One-time certifications of compliance completed	Completed by July 14, 2020	Compliance with local, state and federal dental regulations
Schools: Secondary	Outreach materials targeted at middle schools	Educational materials distributed including "A Closer Look at Mercury" materials	Materials distributed to 2 school districts within 5 years	Product substitution, spill and waste management
Schools: College	Interviews and site visits as part of commercial laboratory technical assistance work already underway.	Report on status of mercury use and management in universities.	Inspections completed in 2 years, to be reported in Pretreatment Program annual report	Product substitution, spill and waste management
Other industries and Pretreatment Program	One-time monitoring of all SIUs and non-food NSUs	Monitoring finished, report to be produced including monitoring data and steps forward	Report to be completed within 1 year	Product substitution, spill and waste management
	Evaluation of new industries as sources of mercury	Evaluation of chemical list in wastewater discharge application	Ongoing	Product substitution, spill and waste management

6. Term and Requirements of the Variance

The following table summarizes the state and federal requirements regarding the term of the variance, and DEQ's proposed term of the variance for the Rock Creek AWWTF.

Term of the Variance for Rock Creek AWWTF	
Regulatory requirement	**DEQ proposal**
The duration of a variance must not exceed the term of the NPDES permit. If the permit is administratively extended, the requirement of the variance will continue to be in effect. OAR 340-041-0059(3)	The variance term will be the term of the permit, including any administrative extension, not to exceed the ten-year time interval specified below.
The term of the variance must be expressed as an interval of time from the date of EPA approval or a specific date. CFR131.14 (b)(1)(iv)	The variance term will be the term of the permit, including any administrative extension, not to exceed ten years from the date EPA approves the variance.
The term of the variance must only be as long as necessary to achieve the highest attainable condition. CFR131.14 (b)(1)(iv)	The highest attainable condition is the LCA and the MMP. The LCA-based permit limit will apply throughout the term of the permit. The MMP will identify feasible actions to reduce mercury throughout the ten-year term of the variance. The HAC must be re-evaluated every five years. At this time, the MMP will be updated if additional feasible reduction activities are identified.
If the variance term is greater than five years, it must specify a frequency to re-evaluate the HAC using all existing and readily available information and a provision specifying how the state intends to obtain public input on the re-evaluation. The re-evaluations must occur no less than every five years and must be submitted to EPA within 30 days of completion of the reevaluation. CFR131.14 (b)(v)	DEQ will reevaluate the HAC based on existing and readily available information five years from the date the variance is approved by EPA, or upon permit renewal, whichever occurs first. DEQ will provide an opportunity for public comment on the reevaluation of the HA~~E~~C and submit its findings to EPA. Any modification or addendum to the Mercury Minimization Plan that occurs upon re-evaluation of the variance becomes a requirement of the permit at the time the reevaluation of the HA~~E~~C is submitted to EPA.

The variance regulations at CFR131.14 require establishing the highest attainable condition as the greatest pollutant reduction achievable with the currently installed optimized technology and adoption and implementation of a PMP. To implement this regulation, the requirements of the variance will include the following:

1. A numeric effluent limit to be included in the permit based on the highest effluent condition that can be achieved with the currently installed treatment system optimized (well operated and maintained).
2. The adoption and implementation of an MMP. CWS will submit an updated MMP (http://cleanwaterservices.org/media/1443/mercury-minimization-plan.pdf) to identify the feasible minimization program actions that can be implemented over the proposed 10-year term

Commented [A36]: In the approval of ODEQ's variance standard EPA stated:
The duration of a variance must not exceed the term of the NPDES permit. EPA understands this section to mean that each variance will expire five years after the State adopts the variance, the maximum length of a NPDES permit consistent with federal regulations and OAR 340-045-0035(8), or the variance will specify a specific expiration date of less than five years after the variance was adopted into state regulation.

EPA is currently only able to approve a variance length of 5 years or less in Oregon, to be consistent with state law.

Commented [A37]: This wording is an issue. We cannot approve anything that links the term of a variance to an administrative continuation under the permit regulations. We have made a legal argument that administratively continuing a permit does not affect the term of the variance. The permit that currently implements the variance will continue to reflect variance conditions if it is administratively continued but the variance from the WQS standpoint must expire at the end of the variance term.

Commented [A38]: If Oregon's regulations were updated to incorporate longer variance timeframes, all parts of the HAC would need to be reviewed every 5 years, not just the MMP.

Commented [A39]: This must be submitted with the variance package. This link is to a 2016 version and is outdated.

of the variance. The updated MMP will be available for public review and comment together with the variance and the draft permit modification.

Commented [A40]: See comments above.

3. CWS shall submit an annual report of influent and effluent monitoring data (as required below), mercury reduction actions completed and an evaluation of the mercury reduction program effectiveness to the DEQ one year from the effective date of the permit and annually thereafter. This report may be submitted together with the facility's annual pre-treatment report, which also includes influent and effluent monitoring data.

Additional permit requirements independent of the variance, which may overlap with the above mercury reduction requirements, are expected to include the following:

1. Pretreatment: CWS will continue to operate a pretreatment program for mercury as described in their permit requirements.
2. Monitoring: The Rock Creek AWWTF shall continue to meet the mercury monitoring requirements described in Schedule B of the permit. Additional monitoring may be conducted to characterize the quarterly or annual average mercury concentrations in the effluent at the facility's discretion.
3. Reporting: CWS shall submit analytical data from the aforementioned monitoring requirements per the reporting requirements detailed in Schedule B of the permit (same as #3 above).

7. Public Information and Comment

This is a placeholder. A summary of public information provided and public comment received will be included here following the public comment period on the variance